

1.2 Research and Training Program

(1) Global COE Program

The 21st Century COE Program ended in FY2006, and was replaced by the Global COE Program as of FY2007. Tottori University has applied under the category of interdisciplinary research and new disciplines under the program title Global Center of Excellence for Dryland Science. As a result of our research record and the strength of our proposal, ALRC was one of only 12 proposals (of a total of 105) that received funding under this program. (The overall acceptance rate, including other categories of program, was 63 of 281 proposals.)

- Program title: Global Center of Excellence for Dryland Science
- Departments and graduate schools: ALRC, Department of Global Arid Land Science, United Graduate School of Agricultural Sciences, Department of Medicine, Graduate School of Medical Sciences
- Cooperating organizations: Division of Earth and Ecosystem Sciences, Desert Research Institute (DRI, Las Vegas and Reno, Nevada, USA); Biodiversity and Integrated Gene Management Program, International Center for Agricultural Research in the Dry Areas (ICARDA, Aleppo, Syria).

1) Aims of Establishing the COE

Tottori University:

- believes that ALRC can meet the world's highest standards to create a unique research base,
- educates competent students who will play an active part in the United Nations, in other international organizations, and in overseas research facilities that focus on arid land science and combating desertification,
- focuses on research into strategies to combat desertification and ameliorate the global environmental problems that originate in arid lands (e.g., cross-border transport of dust), and
- is developing a base for education and research that will be a world leader in arid land research (i.e., a Global COE).

The objectives for developing this base are:

1. Developing world-class researchers, improving the education system, and training graduates who will be employed by U.N. organizations, other international organizations, and overseas research institutions.
2. Propelling world-class research, improving research systems, and translating and disseminating technologies and knowledge developed at Tottori University, as well as systematizing information on dryland health and medicine and contributing solutions to environmental problems such as Aeolian dust transport.
3. Establishing a global academic network by improving systems for cooperation and supporting the Global COE by the development of a world research network and linkages between this network and other related domestic Japanese networks.

2) Outline of Establishing the COE

(a) Targets for human resource development and measures to achieve these targets:

1. Increasing the number of students: Increasing the number of students registered in PhD and other graduate studies will be achieved by characterizing and enhancing the educational curriculum for researchers and practical engineers, introducing and implementing a dual-degree system, and financially supporting PhD students.

2. Increasing research outcomes: Research outcomes such as conference presentations and journal articles will be increased by fostering an independent research environment and providing funds to support research by excellent assistant professors, establishment of research-oriented assistant professorships, and provision of incentives for oral presentations or the publication of papers.
 3. Enhancing proficiency in English: Enhancing proficiency in English will be attained by means of a mandatory English test and provision of financial support for learning the language, implementation of an English training program, and sending young researchers abroad.
 4. Increasing employment of graduates by the United Nations, international organizations, and international cooperation organizations: Increasing the opportunity for the employment of graduates by international organizations will be achieved by providing the needed support, including financial support, to obtain jobs at such institutions after completion of a PhD, training in language and presentation skills, and systematic collection of job information.
 5. Increasing the employment of graduates by research institutions, especially foreign institutions: This goal will be achieved by the establishment of a joint educational program with the DRI (Las Vegas and Reno, Nevada, USA) and establishment of a new division at ALRC (i.e., the Division of Health and Medicine), and by the appointment of new faculty members in this Division.
- (b) Targets of research activities, and measures for reaching these targets:
1. Activation of research activities: Goals include producing world-class research articles based on original research of the highest standard, increasing the number of peer-reviewed articles (especially in journals included in the Web of Science database), and transferring research achievements to society and contributing to the improvement of communities in drylands by supplying fundamental knowledge and useful solutions produced through the COE's research and development to prevent desertification and promote the sustainable utilization of drylands.
 2. Targets in research infrastructure: Goals include creating an international research environment where young researchers can flourish and develop their skills and an international career, coordinating a research environment where excellent young researchers can devote themselves to research by forging new and innovative directions, and providing financial support and unique research facilities and equipment for excellent young researchers through alliances with other centers of excellence.
 3. Promotion of research and cooperation: This program will involve the establishment of five research groups:
 - a. The Environmental Restoration Group aims to prepare a manual on preventing salinization and to disseminate technology to prevent and reverse salt accumulation.
 - b. The Agricultural Production Group aims to use organic matter and salt-tolerant plants to restore soils that have experienced a substantial accumulation of salt and to improve their productivity in arable drylands.
 - c. The Molecular Breeding Group aims to permit the cultivation of salt- and drought-resistant strains in drylands within 5 years.
 - d. The Dryland Health and Medicine Group aims to investigate the relationship between the health and economic status of residents of China's Loess Plateau and analyze changes over time to identify the effects of regional policies on their health. It also plans to study diseases endemic to drylands with the aim of developing effective countermeasures.
 - e. The Global Environmental Group aims to develop a biogeophysical model for simulating the

processes that lead to the development of dust storms so as to predict dust events and evaluate the impact of land use on these processes.

(c) Plan for international cooperation

Tottori University will develop its COE in collaboration with DRI and ICARDA. DRI is recognized for its world-class studies in dryland earth science. It is the core institution in the Global Network of Dryland Research Institutions (GNDRI). Through collaboration with DRI, Tottori University aims to raise the standards of its research in dryland earth science, enhance its international linkages through GNDRI, and expand educational activities at its graduate school. ICARDA is one of 15 centers around the world supported by the Consultative Group on International Agricultural Research (CGIAR). It is well known for its world-class studies in dryland agricultural science. ICARDA is currently implementing an initiative, the "CWANA-Plus Partnership," with the United Nations University, Japan. CWANA-Plus aims to strengthen research and development in countries with large dryland areas prone to desertification. These include the vast CWANA region (Central and West Asia, North Africa), as well as large parts of China, South Asia, and sub-Saharan Africa. By collaborating with ICARDA, Tottori University aims to improve its research in dryland agricultural science, enhance its international linkages through the CWANA-Plus Partnership, and promote practical application and dissemination of technologies developed there to dryland countries, especially in Asia and Africa.

3) Intermediate Evaluation

An intermediate evaluation was carried out on this program by Global COE Program Committee in FY 2009. The program received the highest rank, which is the category; "By continuing the current effort, it should be possible to achieve the project's original objectives." Especially the program had the following evaluation in the aspect of research; "international and unique research activities have been carried out through the collaborative research with overseas partner institutions, and research achievements can be appreciated since activation such as increase of presented papers have been seen."

(2) International Training Program (ITP)

International Training Program (ITP) was launched in FY 2007 by the Japan Society for the Promotion of Science (JSPS), and Tottori University's proposed program was selected, which will run for five years starting from FY 2008. ITP aims to strengthen overseas research and education opportunities for young researchers in Japanese universities. To advance these objectives, ITP supports Japanese universities in their organizational efforts to establish collaborative relationships with overseas research institutes and groups. "Young researchers" under this program are graduate students (master's and doctoral course students), postdoctoral researchers, and assistant professors of an equivalent level.

Tottori University's program "Capacity Building for Integrated Resource Management in Drylands" aims to develop world-class young researchers in the field of dryland study, which is one of the most proven research areas in Tottori University. This human resources development program is designated to train talented professionals to execute their missions at universities overseas, United Nations organizations, and international research organizations.

Under this program Tottori University sends master course's students to drylands in Tunisia, Syria and China for about a year. While they attend lectures on wide-ranging subjects in dryland study and conduct field work. All lectures and research guidance are given in English and students can acquire enriched international sensibility as well as English-language skills while also studying and researching with an

international group of students.

Tottori University adopted the “Joint Master’s Degree Program in Integrated Management in Drylands (MS Program),” which is offered through a partnership between the United Nations University and other five institutions including Tottori University.

- Departments: Headquarters for Planning and Promoting International Strategies, the United Graduate School of Agricultural Sciences, Arid Land Research Center
- Overseas partner institutions: United Nations University (Canada), Cold and Arid Regions Environmental and Engineering Research Institute, CAS (China), Institute of Arid Regions (Tunisia), the National Agricultural Research Institute of Tunisia (Tunisia), International Center for Agricultural Research in the Dry Areas (Syria), Mediterranean Agronomic Institute-Bari (Italy), The Global Mechanism (GM) of the United Nations Convention to Combat Desertification (UNCCD)(Italy)

Goals

We have the following three goals on this program and aim to achieve those.

- (1) Well developing educational activity to young researchers, such as enhancement of English education and improvement of teaching system for making research proposal and writing thesis etc.
- (2) Implementing capacity building in a strategic way to conduct the program smoothly, by cooperating with related departments in Tottori University
- (3) Establishing a appropriate cooperation system among the overseas partner institutions in education and research and in administration and management of the program

Organization

Name	Affiliation	Field of specialization	
Sadahiro YAMAMOTO	Professor, the United Graduate School of Agricultural Sciences	Environmental soil science	Chief Professor
Hisashi TSUJIMOTO	Professor, the United Graduate School of Agricultural Sciences	Plant breeding science	
Kiyoshi TANAKA	Professor, the United Graduate School of Agricultural Sciences	Plant physiology	
Yoshinobu KITAMURA	Professor, the United Graduate School of Agricultural Sciences	Water-use	
Satoshi YAMADA	Associate Professor, the United Graduate School of Agricultural Sciences	Plant nutrition	
Eiji NISHIHARA	Associate Professor, the United Graduate School of Agricultural Sciences	Dryland agronomy	
Kumi YASUNOBU	Associate Professor, the United Graduate School of Agricultural Sciences	International agricultural development	
Koji INOSAKO	Associate Professor, the United Graduate School of Agricultural	Water and soil environmental	

	Sciences	conservation	
Atsushi TSUNEKAWA	Professor, Arid Land Research Center	Conservation informatics	
Masato SHINODA	Professor, Arid Land Research Center	Climatology	
Mitsuhiro INOUE	Professor, Arid Land Research Center	Land conservation	
Norikazu YAMANAKA	Professor, Arid Land Research Center	Revegetation in arid land	
Mitsuru TSUBO	Associate Professor, Arid Land Research Center	Plant production	
Reiji KIMURA	Associate Professor, Arid Land Research Center	Meteorology	
Haruyuki FUJIMAKI	Associate Professor, Arid Land Research Center	Soil Conservation	
Ryoji WAKA	Professor, Center for International Affairs	Fluid engineering	

Intermediate Evaluation

An intermediate evaluation was conducted by JSPS at the 2-year point of implementation (in FY 2010) based on the evaluation documents (progress reports) submitted by Tottori University. This program received the second highest rank of the four categories; "It has largely achieved results, and it should continue by keeping making the current effort." This result led to continuance of the program after FY 2011.

(3) JSPS-Institutional Program for Young Researcher Overseas Visits

We have started Institutional Program for Young Researcher Overseas Visits in 2010 February by Japan Society for the Promotion of Science (JSPS) and will work on this program for three years. We aim to foster talented young researchers through overseas visits to research institutions.

Overseas Research Institutions

- International Center for Agricultural Research in the Dry Areas (ICARDA)
- Deserat Research Institute (DRI)
- Cold and Arid Regions Environmental and Engineering Research Institute (CAREERI)
- Institute of Soil and Water Conservation Academy of Sciences & Ministry of Water Resources (ISWC)
- Institute of Meteorology and Hydrology (IMH)
- University of California, Riverside (UCR)
- University of California, Davis (UCD)
- National Institute of Forestry, Agricultural and Animal Research (INIFAP)
- The Northwestern Center of Biological Research (CIBNOR)

Number of dispatched researchers (FY2011 departure)

- Short-term visits (approx. 2weeks) 10 researchers
- Medium-term visits (approx. 2-6months) 5 researchers

(4) Project Asian Dust

We have started Project Asian Dust “Assessment and Control of Dust emission in Degraded Drylands of East Asia” sponsored by the Ministry of Education, Culture, Sports, Science and Technology in FY 2011. The goal of this project is to assess the dust effects on human health and environments, to elucidate the dust emission and sandstorm mechanisms, and to develop mitigation techniques.

The aim of this project is to clarify the sandstorm and dust emission mechanisms in the drylands of Mongolia and China, study the effects of dust on human health, human activity, and ecosystems in the source drylands and in Japan and conduct research to develop effective measures to control sandstorms and dust emission in source areas.

Research Organization

- Project Reader Norikazu YAMANAKA (Dust and Sandstorm (DSS) Control Group)
- Vice Project Reader Masato SHINODA (Dust Emission Group)

Research Group

○Dust Emission Group

Name	Affiliation
Masato SHINODA : Leader	Professor, Climatology and Water Resource, Arid Land Research Center
Reiji KIMURA	Associate Professor, Climatology and Water Resource, Arid Land Research Center
Yasunori KUROSAKI	Assistant Professor, Climatology and Water Resource, Arid Land Research Center
Masao MIKAMI	Director, Japan Meteorological Agency, Meteorological Research Institute
Eiji NISHIHARA	Associate Professor, Agricultural, Biological and Environmental Sciences, Faculty of Agricultural

○Effect Assessment Group

Name	Affiliation
Youichi KUROSAWA: Leader	Professor, Faculty of Medicine
Shinji OTANI	Junior Associate Professor, Health and Medicine, Faculty of Medicine
Takehito MORITA	Associate Professor, Veterinary Medicine, Faculty of Agriculture
Akinori SHIMADA	Professor, Veterinary Medicine, Faculty of Agriculture
Atsushi TSUNEKAWA	Professor, Biological Production, Arid Land Research Center
Mitsuru TUBO	Associate Professor, Biological Production, Arid Land Research Center
Kazunari ONISHI	Assistant Professor, Faculty of Medicine

○Dust and Sandstorm (DDS) Control Group

Name	Affiliation
Norikazu YAMANAKA :Leader	Professor, Afforestation and Land Conservation Arid Land Research Center

Takeshi TANUGUCHI	Assistant Professor, Afforestation and Land Conservation, Arid Land Research Center
Dai NAGAMATSU	Associate Professor, Regional Environment, Faculty of Regional Science
Fukuju YAMAMOTO	Professor, Agricultural, Biological and Environmental Sciences, Faculty of Agriculture
Toshihiko KINUGASA	Assistant Professor, Agricultural, Biological and Environmental Science, Faculty of Agriculture

Overseas Research Institutions

- Institute of Meteorology, Hydrology and Environment of Mongolia
- Mongolian State University of agriculture
- Cold and Arid Regions Environmental and Engineering Research Institute
- Inner Mongolia University
- Inner Mongolia Agricultural University
- Desert Research Institute (USA)
- University of Cologne (Germany)